

Does Merit-Based Aid Improve College Affordability?

Testing the Bennett Hypothesis in the Era of Merit-Based Aid

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Abstract

This study tests the Bennett hypothesis by examining whether or not four-year colleges changed listed tuition and fees, the amount of institutional grants per student, and room and board charges after their states implemented statewide merit-based aid programs. Based on the fact that many statewide merit-based aid programs covered full tuition and fees for students enrolled in their state colleges, I hypothesized that colleges whose states implemented merit-based aid programs would raise student charges or reduce institutional aid to capture the rents. Using the difference-in-difference method, I analyze the Integrated Postsecondary Education Data System (IPEDS) from 1987 to 2009. My results show that colleges significantly changed their prices, but did not always increase the net price that students had to pay. Public colleges in many states with merit-based aid reduced published tuition and fees and increased the amount of institutional grants per student. These results suggest that the implementation of merit-based aid programs makes college education more affordable for those who received the aid, and does not harm non-recipients.

Key words: merit-based aid, the Bennett hypothesis, tuition, institutional aid

Introduction

College affordability has become an important concern across the country. According to a national survey in 2009, more than half of American adults surveyed believed that academically qualified students did not have enough opportunities for college education in spite of its importance for their future success (Immerwahr et al., 2010). Rising college costs and student debt levels also suggest that college education is out of reach even for many students from middle-income families. To mitigate the financial burden of students and families, governments and colleges spend a huge amount of money on financial aid. In 2010, federal and state governments invested approximately 141.3 billion dollars, and colleges spent 29.7 billion dollars on undergraduate financial aid (College Board, 2011a).

Among many scholarship programs, statewide merit-based aid is a new type of financial aid that covers tuition and fees for in-state college students exclusively based on academic merit. Due to its simple rules and broad coverage, statewide merit-based aid has been widely available across the country and draws lots of attention from researchers. To date, researchers show that merit-based aid largely increases freshman enrollments across all racial groups, particularly in four-year public colleges (Cornwell, Mustard, & Sridhar, 2006; Dynarski, 2002). Given these results, it seems clear that merit-based aid is successful at boosting freshman enrollments. However, little is known about its potential, and sometimes negative, impact on students and colleges. One of the potential consequences is its impact on college tuition as suggested in the Bennett hypothesis. According to the Bennett hypothesis, increases in federal aid make it easier for colleges to raise their tuition because the aid will help students pay tuition (Bennett, 1987). The hypothesis seems plausible in the case of merit aid given that merit aid programs cover a substantial portion of listed tuition and fees for a majority of students in state public colleges. If state governments paid tuition, why would students and colleges be concerned much about tuition increases?

My study examines how colleges responded to the creation of statewide merit-based aid and the impact of these responses on college affordability. Although many studies show the positive impact of financial aid on student demand, little is known about its impact on the supply side (Leslie & Brinkman, 1987; Heller, 1997). However, understanding institutional responses to financial aid is important because colleges can modify the impact of financial aid by changing tuition, room and board charges, and the amount of institutional grants (Long, 2004). This study investigates a relatively unexplored area, institutional responses to financial aid, and demonstrates that a financial aid policy that provides institutions with different incentives may not be as effective as originally intended. The results can inform state policy makers who are interested in whether or not their merit-based aid policy has improved college affordability, especially given the recent tuition hikes and economic recessions (Baum & Ma, 2011; Quizon, 2011).

Background

Since the early 1990s, statewide merit-based aid has been prevalent across the country. After Arkansas started its Academic Challenge Scholarship in 1991, more than a dozen states implemented statewide merit-based aid programs.¹ Following previous studies (e.g., Dynarski, 2002; Zhang & Ness, 2010), I define statewide merit-based aid programs as programs whose eligibility is solely determined by students' academic achievement and programs that target a

¹ According to the NASSGAP (2011), all except seven states provided non-need-based grants in the academic year of 2010 to 2011. However, some of these non-need-based grants consider students' financial needs as well as academic performances.

Table 1. Statewide Merit-Based Scholarship Programs

State (Start Year)	Initial Criteria	Award amounts per year
Alaska (1999/ 2011)	1. UA Scholars Program (UA System only; top 10% of graduating class)	\$2,750
	2. Alaska Performance Scholarship (three-tiered)	
	1) 3.5 GPA & 25 ACT or 1680 SAT 2) 3.0 GPA & 23 ACT or 1560 SAT 3) 2.5 GPA & 21 ACT or 1450 SAT	1) \$4,755 2) \$3,566 3) \$2,378
Arkansas (1991)	Arkansas Academic Challenge Scholarship - 2.5 GPA in HS core & 19 ACT	Public & Private: 1 st year: \$2,500 2 nd year: \$2,750 3 rd year: \$3,000 4 th year: \$3,500
Florida (1997)	Florida Bright Futures Scholarship (two-tiered)	Public
	1. Florida Academic Scholar H.S. (3.5 GPA & 1270 SAT) 1. Florida Medallion Scholar H.S. (3.0 GPA & 970 SAT)	1. 100% tuition & fees 2. 75% tuition & fees Private The average public tuition & fees
Georgia (1993)	Helping Outstanding Pupils Educationally - 3.0 GPA	Public: full tuition & fees Private: \$3,000
Kentucky (1999)	Kentucky Educational Excellence Scholarship - 2.5 GPA	Public: \$125-\$2,500 Private: equivalent (Award varies based on a high school GPA from 9 th to 12 th grade. Additionally, students can earn bonus amount based on SAT/ACT scores and AP/IB exams)
Louisiana (1998)	Taylor Opportunity Program for Students (three-tiered)	Public:
	1. Honors Award - 3.0 GPA & 27 ACT	1. Tuition & fees + \$800
	2. Performance Award - 3.0 GPA & 23 ACT	2. Tuition & fees + \$400
	3. Opportunity Award - 2.5 GPA & ACT score above the state's average	3. Tuition & fees Private: The average public tuition & fees
Maryland (2002-2005)	Maryland HOPE Scholarship - 3.0 GPA in HS Core	Public & Private: \$3,000 (subject to availability of fund)
Massachusetts (2005)	The John and Abigail Adams Scholarship - Score "advanced" or "proficient" AND top 25% of graduating class in their district in MCAS math and English	Public only: tuition only (up to six semesters)

Table 1. Statewide Merit-Based Scholarship Programs (continued)

State (Start Year)	Criteria	Award
Michigan (2000-2008)	Michigan Merit Award & Promise Scholarship - Level2 on all four components of MEAP test or, - Level2 on two components of MEAP test and 75 th percentile of SAT/ACT	In-state public & private: \$2,500 Out-of-state public & private: \$1,000 Not renewable (one-time award)
Mississippi (1996)	1. Mississippi Resident Tuition Assistance Grant (MTAG) - 2.5 GPA & 15 ACT 2. Mississippi Eminent Scholars Grant (MESG) - 3.5 GPA & 29 ACT	Public & Private: Freshmen/Sophomore: \$500 Junior/Senior: \$1,000 Up to \$2,500 per year (no more than tuition and fees)
Missouri (1987)	Bright Flight Scholarship - Top 3-5% of all MO students taking either ACT or SAT	Depending on annual funds (Up to \$3,000 for public & private)
Nevada (2000)	Millennium Scholarship - 3.0 GPA & pass the state's exit exam	Public only Up to \$2,500
New Mexico (1997)	Lottery Success Scholarship - No H.S. criteria - 2.5 GPA at the 1 st semester in college	Public only: tuition & fees
South Carolina (1998)	LIFE Scholarship - 3.0 GPA & 1100 SAT/24ACT	Public & Private: \$2,000
Tennessee (2004)	Tennessee Educational Lottery Scholarship (four-tiered) 1. GAMS - 3.75 GPA & 28 ACT 2. HOPE Base - 3.0 GPA or 19 ACT 3. ASPIRE - 3.0 GPA or 19 ACT & AGI<36k 4. ACCESS - 2.75 GPA & 18 ACT & AGI<36k	Public & Private: 1. \$4,000 2. \$3,000 3. \$4,000 4. \$2,000
West Virginia (2002)	PROMISE - 3.0 GPA & 1000 SAT/21 ACT	Public: tuition & fees Private: average tuition & fees

Source: Dynarski (2002); Dynarski (2005); Hu, Trengove, and Zhang (2012); Orsuwan & Heck (2009); Zhang & Ness (2010); States' web sites

wide population of resident students rather than a few elite students. Table 1 summarizes each of these programs' inception year, eligibility requirements and award amounts when each program was first implemented. In some states, eligibility standards and award amounts have changed over time. Because my study examines changes in student charges right before and after merit-based aid was implemented, I focus on the academic requirements and award amounts applied during the first year of implementation of each merit-based aid program in this study.

According to Table 1, merit-based aid programs have some common features although their academic requirements and award amounts differ. First, most programs set the academic standard around a 3.0 high school GPA. This standard makes it possible for these programs to benefit a large number of resident students considering that approximately "40% of high school seniors in 1999 met this standard" across the country (Dynarski, 2002, p. 64).

Second, most programs cover more than half of tuition and fees at their state's public four-year colleges, especially when each of these programs was adopted. Table 2 provides the average tuition and fees at public and private four-year institutions when each state started its merit-based aid program. Several states (e.g., Georgia and Florida) subsidized 100% of tuition and fees for students enrolled in public four-year colleges, while other states such as New Mexico and Nevada provided a fixed amount of money that was sufficient to pay tuition and fees at public four-year colleges.

Lastly, most of these programs, except ones in Massachusetts, Nevada, and New Mexico, provide the equivalent amount of money to students enrolled in private colleges in their states. The amount was not sufficient, but it would still have been helpful for these students to pay their tuition. Considering the lenient academic standards and generous award amounts, merit-based

Table 2. Merit-Based Aid Award Amounts and the Average Tuition Levels

State	Award Amount	Average Tuition & Fees (in Current Dollars)	
		Public Four-Year	Private Four-Year
AR ²	\$2,500	\$1,805	\$5,721
FL	Pub: 75% to 100% of tuition and fees Priv: Weighted average t&f of Public 4-year colleges	\$1,911	\$11,525
GA	Pub: Tuition and fees Priv: \$1,500	\$1,886	\$9,040
KY	\$500-\$2,500 (Depending H.S GPA & ACT score)	\$2,723	\$9,614
LA	Pub: Tuition and fees Priv: Weighted average t&f of Public 4-year colleges	\$2,390	\$14,003
MA	Tuition only (up to 6 semesters)	\$7,290	\$27,335
MI	\$1,250 (for the first 2 years)	\$4,615	\$11,155
MS	MTAG: Freshmen & Sophomore: \$500 Junior & Senior: \$1,000 MESG: \$2,500	\$2,497	\$7,226
NM	Tuition only (from the 2 nd semester) (public only)	\$2,073	\$8,943
NV	\$2,500	\$2,344	\$11,465
SC	Pub: \$2,000	\$3,414	\$10,660
TN	\$4,000	\$4,039	\$15,074

² Due to the data availability, the average tuition and fees at public and private four-year colleges in Arkansas are for the academic year of 1993 to 1994. Considering that the tuition and fees are non-decreasing over time, I assume that tuition and fees in 1991 would have been even lower than the amount shown in the table.

WV	Pub: Tuition & Fee		
	Priv: Equivalent Amount	\$2,898	\$12,441

aid might be an easier target from which colleges can appropriate revenue compared to other financial aid programs.

Conceptual Framework

My study is grounded on the Bennett hypothesis and Bowen's revenue theory of costs. The Bennett hypothesis suggests that colleges increase listed tuition and fees to capture additional revenue resulting from an increase in financial aid. This hypothesis rests on the revenue theory of costs that argues that colleges try to increase revenue as long as it does not harm their reputations (Bowen, 1980). According to Bowen, there is a spiral effect among college finances (including tuition and institutional aid), educational quality, and reputation. Colleges with large external subsidies from governments and philanthropies can afford charging less for students and spending more on education. This investment in turn attracts high-performing students and scholars to their institutions, which enhances the colleges' reputations. These renowned colleges with high-achieving students and scholars then attract more external funding from governments and private sectors, and the spiral goes on. The fact that most colleges are non-profit also allows them to spend as much revenue as they have (Martin, 2011).

To summarize, colleges seek for more revenue to invest in their students, scholars, and facilities to enhance their reputation. Because most merit-based aid programs cover a substantial portion of tuition and fees for a majority of their state resident students, I hypothesize that colleges attempt to capture this new source of revenue by increasing their listed tuition and fees, reducing their own spending on institutional grants, or increasing room and board charges.

Literature Review

Overall, researchers find the positive effects of merit-based aid on students' academic preparation, college enrollment, and graduation. First of all, merit-based aid appears to motivate high school students to work hard to meet the academic requirements. After the HOPE scholarship started in Georgia, the average SAT scores of high school seniors and college freshmen significantly increased (Cornwell, Mustard, and Sridhar, 2006; Henry and Rubenstein, 2002). In Tennessee, the number of students who scored 19 or above on ACT, which was the cut-off score to receive the state's merit-based aid at the time, increased after the implementation of the merit-based aid (Pallais, 2009).

Second, the availability of merit-based aid increases college enrollments across all racial groups, especially in four-year colleges (Cornwell, Mustard, and Sridhar, 2006; Dynarski, 2002). After analyzing the data for seven Southern states that adopted merit-based aid before 2000, Dynarski (2002) shows that merit-based aid in all seven states but South Carolina has significant and positive effects on college enrollments. Zhang and Ness (2010) argue that merit-based aid keeps the best and brightest students in their states because the enrollment increases after the implementation of merit-based aid programs are the largest in research universities that are typically more selective than any other types of institutions.

Lastly, merit-based aid also promotes degree attainment. At the state level, Dynarski (2005) finds that the share of adults with college degrees (at least an associate's degree) significantly increased after Arkansas and Georgia introduced their merit-based aid programs. In Georgia and Florida, Zhang (2011) also reports the increased number of bachelor's degree-holders after the implementation of merit-based aid programs. Both studies show that the positive effects are larger

for women than men. At the student level, Henry, Rubenstein, & Bugler (2004) show that HOPE recipients in Georgia are more likely to persist and graduate within four-years compared to students who lost or never received the HOPE scholarship. Looking at West Virginia, Scott-Clayton (2011) also provides evidence that the incentive embedded in the state's PROMISE scholarship encourages students to take sufficient credits to graduate within four-years.

Despite these positive effects, there are concerns about the unintended consequences of merit-based aid. First, Heller and Marin (2002; 2004) suggest that the fact that merit-based aid is assigned solely based on academic achievement could limit college access for racial-minority or low-income students who, on average, have lower test scores. However, Singell Jr., Waddell, and Curs (2004) find that the number and proportion of low-income students do not decrease in both two-year and four-year colleges after Georgia's HOPE scholarship started. In addition, there is some evidence that merit-based aid increases enrollment and degree attainment of both white and non-white students (Cornwell, Mustard, and Sridhar, 2006; Dynarski, 2002, Dynarski, 2005). Considering these results, merit-based aid appears to have positive effects across racial and income groups. Another concern regarding merit-based aid is its impact on institutions. Because merit-based aid provides a majority of students enrolled in public colleges with grants of high monetary values, colleges might try to capture the rents by raising their tuition, as suggested in the Bennett hypothesis.

To date, only a few studies have examined whether the Bennett hypothesis holds true in the context of merit-based aid. Long (2004) finds that private four-year colleges in Georgia directly increased tuition and fees, while public four-year colleges decreased tuition and increased room and board charges. These price increases were the most pronounced in colleges with many HOPE recipients. In contrast, since the inception of Florida's Bright Futures Scholarship, Calcagno and

Alfonso (2007) find that community colleges in Florida increased the amount of institutional grants without changing tuition and fees. The authors explain that these community colleges seemed to cover the unmet needs (the difference between listed tuition and fees and grants from all sources) of their students because many community college students were eligible for the Florida Medallion Scholars, which provided only 75% of tuition and fees.³

The Bennett Hypothesis was also tested with other federal and state financial aid programs. When the revenue from the Pell Grants or federally subsidized loans increased, there were significant tuition raises in public four-year colleges (McPherson & Shapiro, 1991), state flagship universities (Rizzo & Ehrenberg, 2004) and both public and private four-year colleges (Singell & Stone, 2007). These results suggest that colleges change their tuition in response to the federal policy changes. On the other hand, Lan and Winters (2011) do not find significant tuition changes in colleges that enrolled many D.C. residents after the District of Columbia College Access program started.⁴

Recent studies emphasize the importance of looking at institutional grants in addition to listed tuition and fees when investigating colleges' responses to government financial aid policies. When focusing on Pell Grants recipients, Turner (2012a) finds that students who received more Pell Grants were awarded fewer amounts of institutional grants. In addition, Turner (2012b) shows that colleges reduced the amount of institutional grants approximately dollar-for-dollar for students who received federal tax credits. Because students had to wait until April to receive their tax

³At the time of the study, there were four types of merit-based aid in Florida depending on a student's academic performance. The first two programs for the highest-achieving students covered all tuition and fees, while the other two programs provided only 75% of tuition and fees. Considering the relatively lower academic achievement of community college students, many students in community colleges were expected to receive one of the latter two aid programs.

⁴The D.C. Access program covered the difference between in-state and out-of-state tuition for D.C. residents enrolled in out-of-state colleges.

benefits, they took out loans to pay tuition before their academic year began. These results show that the intended benefit of federal aid programs, to ease the financial burden of students and families by subsidizing tuition and fees, was offset by decreased college grants. Lastly, Curs and Dar (2010) also show that colleges responded differently to state financial aid depending on their governance structures. Public colleges in states with consolidated governing boards and private colleges, both of which enjoy more institutional autonomy, raised their net price in response to increased state aid. In contrast, public colleges in states with coordinating boards, which grant less autonomy, reduced listed tuition and increased institutional grants.

To summarize, colleges appear to respond to external financial aid policies. This response is the greatest in colleges where a large number of students benefit from the policy, or in colleges with more market power and institutional autonomy over tuition setting. Colleges also change institutional grants as well as listed tuition and fees in response to external aid changes. Based on my review of the literature, my study investigates three research questions. First, after merit-based aid policies were implemented, did four-year colleges in merit-based-aid states increase tuition and fees more than colleges in states without merit-based aid? Second, after the policies were implemented, did four-year colleges in merit-based-aid states reduce the dollar-value of institutional grants awarded per student⁵ more than colleges in states without merit-based aid? Third, after the policies were implemented, did four-year colleges in merit-based-aid states increase room and board charges more than colleges in states without merit-based aid?

⁵ Throughout my study, “the dollar-value of institutional grants per student” means the average amount of money that a student receives from his/her institution in the form of grants.

Data & Sample

I use the Integrated Postsecondary Educational Systems (IPEDS) data set collected by the National Center for Education Statistics from 1987 to 2009. IPEDS is the most appropriate existing data set to study postsecondary education institutions because it provides college characteristics, enrollments, and finance information on every postsecondary institution that applied for or participated in any federal financial aid program authorized by Title VI.

I limit my sample to public four-year and nonprofit private four-year colleges across the U.S. I first excluded for-profit colleges because they may have different pricing policies given their explicit goal of making profits. Moreover, a majority of students enrolled in for-profit colleges were non-traditional adult students who were not eligible for state merit aid in most states.⁶ I also excluded two-year colleges because introducing merit-based aid can have different effects on these institutions compared to four-year colleges, as illustrated in Calcagno and Alfonso (2007).⁷ Lastly, I dropped specialized (e.g., seminary or art school) and tribal colleges because many of these colleges are very small, pursue a specific educational goal, and have different revenue structure compared to four-year colleges.⁸

After excluding these colleges, my sample has 449 public four-year colleges and 840 private four-year colleges. Table 3 provides the descriptive statistics of my sample in the academic year of 1990-1991. At this time, there was no statewide merit-based aid program available.⁹ The top panel in Table 3 shows the descriptive statistics for colleges in all 50 states,

⁶ Most merit aid programs were limited to students who immediately went to college after high school graduation.

⁷ There are some colleges who were originally classified as two-year institutions, but changed into four-year institutions in later years. Most of these colleges are branch campuses or community colleges that offer bachelor's degrees in some areas. I treated these colleges as two-year colleges and excluded them.

⁸ In order to exclude these special purpose colleges, I dropped colleges that are classified as associate's institutions, specialized institutions, or tribal institutions according to the Carnegie Classification 2000/2005.

⁹ Missouri's Bright Flight Scholarship was available during the year. However, I do not include the program because it was limited to the top 3-5% students who took the ACT or SAT.

Table 3. Descriptive Statistics of Samples in 1990-1991 (in current dollars)

All 50 States				
	Public (N=449)		Private (N=840)	
	Merit	Non-Merit	Merit	Non-Merit
Tuition & Fees	1,713.3 (460.4)	1,816.1 (683.4)	7,681.4 (3,555.8)	8,632.3 (2,989.0)
Institutional Grant Aid	2,606,379.8 (5,184,482.8)	3,409,412.1 (6,062,356.3)	4,152,109.5 (9,987,164.4)	4,364,755.4 (7,866,662.7)
Room & Board Charges	2,813.0 (654.6)	3,129.4 (809.5)	3,648.9 (1,203.9)	3,719.3 (915.5)
State Appropriation	51,293,205.0 (71,667,659.5)	64,142,718.7 (97,174,295.8)	1,737,566.7 (3,155,878.4)	1,639,749.7 (3,793,545.5)
Private gifts, contracts, endowments, & investments	7,116,868.8 (17,706,073.0)	8,717,136.8 (20,883,783.7)	8,032,662.3 (32,652,977.1)	7,253,309.6 (24,931,330.2)
Southern States Only				
	Public (N=187)		Private (N=258)	
	Merit	Non-Merit	Merit	Non-Merit
Tuition & Fees	1,595.8 (334.8)	1,566.3 (697.2)	6,312.4 (2,783.6)	6,990.9 (2,498.8)
Institutional Grant Aid	2,093,384.6 (2,662,123.6)	2,787,509.8 (5,659,199.2)	2,805,554.1 (6,799,777.7)	2,890,136.5 (4,725,112.3)
Room & Board Charges	2,668.9 (615.0)	2,997.7 (766.0)	3,246.5 (983.3)	3,411.6 (877.0)
State Appropriation	47,769,720.8 (67,380,897.3)	53,827,388.6 (105,777,121.4)	4,500,639.2 (5,800,593.0)	1,639,556.6 (3,021,694.5)
Private gifts, contracts, endowments, & investments	5,651,463.6 (14,615,697.6)	8,361,070.6 (22,783,298.9)	4,365,614.1 (10,043,727.8)	7,797,420.9 (24,378,874.9)

while the bottom panel provides the descriptive statistics only for colleges in Southern states.¹⁰

¹⁰ I compare the descriptive statistics of the treatment group to other Southern states because most states in the treatment group are located in the South.

Across the country, colleges in merit-based-aid states charged slightly lower tuition and room and board charges, provided less amounts of institutional grants, and received less amounts of external resources than colleges in non-merit-based-aid states. This pattern is consistent when I focus on Southern states, except that public colleges in merit-based-aid states charged slightly higher tuition and fees than public colleges in non-merit-based-aid states. This overall pattern refutes the argument that many states adopted statewide merit-based aid programs because their colleges charged higher tuition in the first place.

Methods

To answer my research questions, I use the difference-in-differences model. The difference-in-differences method compares change in an outcome variable for the treatment group to that of the control group after the policy of interest started. For example, in my study, I compare change in tuition seen in the treatment group (colleges whose states implemented merit-based scholarships) to that of the control group (colleges in other states that have not adopted merit-based scholarships) four years before and after the introduction of merit-based aid.

When using the difference-in-differences method, it is important to choose appropriate control groups that are similar to the treatment group except the policy of interest (Angrist & Pischke, 2009). In this study, I employ two control groups: 1) colleges located in the neighboring states of the treatment group and 2) colleges in all 50 U.S. states. The first control group is colleges located in neighboring states that have not adopted merit-based aid programs during the time period studied (four years before and after a treatment state implemented merit-based aid). For example, I compare colleges in Georgia to colleges in the rest of Southern states that never adopted merit-based aid from 1989 to 1996. When the treatment group is located outside the South (e.g.,

Michigan), I compare them to states that belong to the same regional compact (e.g., the Midwestern Higher Education Compact).

In addition to neighboring states, I also use colleges in all U.S. states that never adopted merit-based aid during the time period studied as a control group. Previous studies use Southern states as a control group because most merit-based aid states are located in the South and these states are comparable in terms of higher education demand and economic condition (Dynarski, 2002; Long, 2004; Zhang & Ness, 2010). However, my study looks at thirteen states that adopted merit-based aid programs in different years, and I excluded these states from the control group once they adopted merit-based aid. This decision results in only a few states (e.g., five states) left in the control group for the treatment group that adopted merit-based aid in the mid-2000s. For this reason, I employ the second control group (colleges in all U.S. states) and see if the estimates significantly differ. Using this second control group will complement the sample size issue although it may not be as comparable to the treatment group as the first control group is.

Equation (1) is the statistical model that I use to answer my research questions. I run the model separately for public and private four-year colleges because these two types of colleges substantially differ in terms of tuition levels and the major source of revenue. I also run the model separately for each of the thirteen merit-based-aid states because each state has different higher education context and merit-based aid program, which could lead to different effects across states. In equation (1), y_{ist} is the dependent variable of institution i located in state s in year t . Note that y_{ist} refers to listed tuition and fees for the first research question, the amount of institutional grants awarded per FTE student for the second research question, and room and board charges for the third research question. I take a natural logarithm of these dependent variables so that I can

interpret a coefficient as a percent change as a result of a one-unit change in an independent variable.

$$y_{ist} = \alpha + \gamma(\textit{merit}) + \lambda(\textit{post}) + \delta(\textit{merit} \cdot \textit{post}) + \phi_s(\textit{state}_s) + \theta_t(\textit{year}_t) + X'_{ist} B + \varepsilon_{ist} \quad (1)$$

In the model above, *merit* is a dummy variable for each of the treatment states analyzed, and *post* is a dummy variable that indicates whether or not merit-based aid has been adopted in the treatment state. The interaction term between these two variables (*merit* · *post*) is the key independent variable of this study. If the Bennett Hypothesis holds, the coefficient on the interaction term (δ) will be statistically significant and positive for the first and third research questions, suggesting increased tuition and fees and increased room and board charges, respectively. For the second research question, the negative and statistically significant coefficient on the interaction term (δ) means that colleges reduce the amount of institutional grants per student in response to the creation of merit-based scholarships. I also add year (θ_t) and state fixed effects (ϕ_s) to capture potential year-specific and state-specific effects on college prices.

X_{ist} is a vector of state-level and college-level covariates that are known to affect tuition and financial aid. At the college level, I add a dummy variable that indicates a doctoral-granting institution. I also include state appropriation revenue (only for public college), revenue from private sources (such as investment return, endowment income, private gifts, grants, and contracts), the number of full-time and equivalent (FTE) students, and the number of full-time faculty members. I add these variables because selectivity and size of institutions are closely related to the amount of revenue from external sources (Curs & Dar, 2010; Long, 2004; Lowry, 2001; Rizzo & Ehrenberg, 2004; Singell & Stone, 2007). In addition, there are several state-level time-varying

covariates in the model: the size of young adult population (20 to 24 years old), state unemployment rates, the percentage of bachelor's degree holders among the population, per capita income, and the total amount of state need-based grants awarded. These state-level covariates are related to a state's higher education demand, which in turn affects college enrollment and tuition levels (Cheslock & Hughes, 2011; Lowry, 2001).

When using a panel data set, serial correlation is a serious problem that significantly reduces the standard error of estimates and hence falsely rejects the null hypothesis (Bertrand, Duflo, & Mullainathan, 2004; Wooldridge, 2005). To address this issue, I use cluster-robust standard errors which minimize the impact of serial correlation and heteroskedasticity of errors (Drukker, 2003).

Results

Tables 4 through 7 show the difference-in-differences estimates. Tables 4 and 5 show the results of public four-year colleges using neighboring states and all 50 states as a control group, respectively. Tables 6 and 7 present the results for private four-year colleges using neighboring states and all U.S. states, respectively. Table 8 summarizes all these results. In order to save space, I present only the coefficient on the interaction term between merit-based aid and post-policy dummy variables (δ). Full results are available upon request.

Table 4 provides coefficients and standard errors for public colleges in each of the thirteen treatment states compared to public colleges in their neighboring states. In the first column, I put the name of each treatment state and sample size used in the model for each state. The next three columns show price changes in tuition and fees, the amount of institutional grants

Table 4. Difference-in-Difference Results for Public Colleges (Using neighboring states)

	In-State Tuition (1)	Institutional Grant (2)	Room & Board Charge (3)
Arkansas (N=1298)	0.021* (0.012)	-0.001 (0.045)	0.103*** (0.010)
Florida (N=955)	-0.067*** (0.015)	0.214** (0.071)	-0.012 (0.009)
Georgia (N=1357)	-0.125*** (0.019)	0.414*** (0.061)	0.056*** (0.010)
Kentucky (N=924)	0.052* (0.025)	-0.069 (0.045)	0.018 (0.019)
Louisiana (N=988)	-0.048 (0.047)	0.058 (0.080)	-0.035* (0.016)
Massachusetts (N=137)	0.126*** (0.010)	0.272* (0.130)	0.054** (0.017)
Michigan (N=867)	-0.017 (0.013)	0.359 (0.347)	-0.027* (0.013)
Mississippi (N=985)	-0.147*** (0.021)	0.176** (0.067)	-0.004 (0.010)
Nevada (N=604)	0.097** (0.032)	-0.482* (0.229)	-0.053* (0.027)
New Mexico (N=642)	-0.035 (0.051)	0.010 (0.104)	0.057** (0.025)
South Carolina (N=972)	0.052** (0.020)	0.066 (0.040)	-0.085*** (0.015)
Tennessee (N=727)	-0.017 (0.022)	0.144 (0.099)	-0.113*** (0.019)
West Virginia (N=748)	0.008 (0.027)	-0.065 (0.099)	0.054*** (0.007)

Note: Every model includes state and year fixed effects and covariates. Cluster-robust standard errors are used.
 Note: p-value: *: <0.05, **: <0.01, ***: <0.001

Table 5. Difference-in-Difference Results for Public Colleges (Using all U.S. states)

	In-State Tuition (1)	Institutional Grant (2)	Room & Board Charge (3)
Arkansas (N=3182)	0.032** (0.013)	-0.076 (0.059)	0.086*** (0.009)
Florida (N=2856)	-0.006 (0.031)	0.148** (0.061)	0.016* (0.009)
Georgia (N=3276)	-0.080*** (0.019)	0.304*** (0.059)	0.041*** (0.010)
Kentucky (N=2726)	0.042** (0.019)	-0.009 (0.071)	0.008 (0.011)
Louisiana (N=2781)	-0.042 (0.026)	0.179 (0.137)	-0.021* (0.013)
Massachusetts (N=2424)	0.099*** (0.030)	0.189** (0.087)	0.044*** (0.010)
Michigan (N=2652)	-0.029* (0.017)	-0.002 (0.175)	-0.027*** (0.009)
Mississippi (N=2895)	-0.144*** (0.015)	0.191** (0.083)	-0.001 (0.005)
Nevada (N=2729)	0.053 (0.029)	-0.588* (0.242)	-0.061*** (0.012)
New Mexico (N=2548)	0.065** (0.024)	-0.435*** (0.160)	-0.051*** (0.012)
South Carolina (N=2765)	0.047*** (0.014)	0.037 (0.066)	-0.087*** (0.009)
Tennessee (N=2473)	0.003 (0.018)	0.010 (0.114)	-0.085*** (0.012)
West Virginia (N=2558)	0.018 (0.033)	-0.643* (0.374)	0.040*** (0.008)

Note: Every model includes state and year fixed effects and covariates. Cluster-robust standard errors are used.
Note: p-value: *: <0.05, **: <0.01, ***: <0.001

Table 6. Difference-in-Difference Results for Private Colleges (Using neighboring states)

	In-State Tuition (1)	Institutional Grant (2)	Room & Board Charge (3)
Arkansas (N=1806)	0.091*** (0.020)	-0.095** (0.037)	0.080*** (0.016)
Florida (N=1441)	-0.005 (0.011)	0.330*** (0.029)	-0.003 (0.006)
Georgia (N=1914)	0.018** (0.007)	0.111*** (0.023)	-0.058*** (0.011)
Kentucky (N=1360)	0.005 (0.011)	0.017 (0.021)	-0.017* (0.009)
Louisiana (N=1305)	-0.005 (0.025)	-0.128** (0.048)	-0.005 (0.018)
Massachusetts (N=644)	0.023 (0.016)	0.045 (0.050)	-0.015 (0.011)
Michigan (N=1931)	-0.023*** (0.006)	0.153*** (0.037)	-0.001 (0.007)
Mississippi (N=1412)	-0.007 (0.013)	0.081** (0.026)	0.023** (0.008)
Nevada (N=701)	0.238*** (0.011)	0.729*** (0.050)	-0.028 (0.019)
New Mexico (N=708)	0.111*** (0.020)	0.322*** (0.060)	0.130*** (0.031)
South Carolina (N=1377)	0.004 (0.009)	-0.168*** (0.023)	0.035*** (0.007)
Tennessee (N=1122)	-0.025* (0.012)	-0.051 (0.029)	-0.013* (0.006)
West Virginia (N=966)	0.048 (0.027)	0.236* (0.111)	-0.015 (0.012)

Note: Every model includes state and year fixed effects and covariates. Cluster-robust standard errors are used.

Note: p-value: *: <0.05, **: <0.01, ***: <0.001

Table 7. Difference-in-Difference Results for Private Colleges (Using all U.S. 50 states)

	In-State Tuition (1)	Institutional Grant (2)	Room & Board Charge (3)
Arkansas (N=6065)	0.095*** (0.010)	-0.087*** (0.025)	0.064*** (0.008)
Florida (N=5763)	0.026*** (0.007)	0.279*** (0.018)	0.009** (0.004)
Georgia (N=6242)	0.023*** (0.006)	0.064** (0.026)	-0.064*** (0.007)
Kentucky (N=5559)	0.020*** (0.004)	0.009 (0.011)	-0.012*** (0.005)
Louisiana (N=5497)	0.018** (0.008)	-0.133*** (0.020)	0.000 (0.006)
Massachusetts (N=4831)	-0.026*** (0.009)	-0.051* (0.029)	-0.019*** (0.007)
Michigan (N=5458)	-0.027*** (0.005)	0.097** (0.020)	-0.013** (0.005)
Mississippi (N=5741)	0.008 (0.006)	0.041* (0.024)	0.023*** (0.006)
Nevada (N=5620)	0.215*** (0.008)	0.859*** (0.021)	-0.018* (0.008)
New Mexico (N=5317)	0.207*** (0.005)	0.836*** (0.020)	-0.019*** (0.005)
South Carolina (N=5569)	0.019*** (0.005)	-0.169*** (0.014)	0.035*** (0.004)
Tennessee (N=4976)	0.002 (0.006)	-0.046** (0.018)	0.002 (0.005)
West Virginia (N=5128)	0.052*** (0.011)	0.242*** (0.031)	-0.011 (0.018)

Note: Every model includes state and year fixed effects and covariates. Cluster-robust standard errors are used.

Note: p-value: *: <0.05, **: <0.01, ***: <0.001

Table 8. Results summary table

Outcome	Sign	Public		Private	
		Neighbors	All	Neighbors	All
Tuition	+	5 (AR, KY, MA, NV, SC)	5 (AR, KY, MA, NM, SC)	4 (AR, GA, NV, NM)	9 (AR, FL, GA, KY, LA, NV, NM, SC, WV)
	-	3 (FL, GA, MS)	3 (GA, MI, MS)	2 (MI, TN)	2 (MA, MI)
Institutional Aid	+	4 (FL, GA, MA, MS)	4 (FL, GA, MA, MS)	7 (FL, GA, MI, MS, NV, NM, WV)	7 (FL, GA, MI, MS, NV, NM, WV)
	-	1 (NV)	3 (NV, NM, WV)	3 (AR, LA, SC)	5 (AR, LA, MA, SC, TN)
Room & Board	+	5 (AR, GA, MA, NM, WV)	5 (AR, FL, GA, MA, WV)	4 (AR, MS, NM, SC)	4 (AR, FL, MS, SC)
	-	5 (LA, MI, NV, SC, TN)	6 (LA, MI, NV, NM, SC, TN)	3 (GA, KY, TN)	6 (GA, KY, MA, MI, NV, NM)

per student, and room and board charges after each treatment state implemented its merit-based aid program. For example, 1,298 public four-year colleges in total are used to analyze price changes in response to Arkansas' Academic Challenge Scholarship. After the scholarship was implemented in 1991, public colleges in Arkansas significantly increased in-state tuition and room and board charges by 2.1% and 10.3%, respectively. However, these colleges did not significantly change the amount of institutional grants.

Overall, colleges in many states changed their prices¹¹ in response to the implementation of merit-based aid; however, their responses differed across states and college types. I will first identify a few common patterns observed, and then discuss the heterogeneous responses across states and college types later.

¹¹ Throughout my study, "college prices" or "prices" mean the three outcomes of my study: listed tuition and fees, the amount of institutional grants per student, and room and board charges.

First of all, there is a public-private college difference when I look at the changes in all three outcomes simultaneously. Compared to their neighboring states, public colleges in Florida, Georgia, and Mississippi significantly reduced tuition and fees and increased institutional grants per student. In contrast, private colleges in Georgia, Nevada, and New Mexico significantly increased tuition and fees and institutional grants. Although there are some states that deviate from these trends, I find that private colleges increased tuition and institutional grants more frequently than public colleges did. In addition, when compared to the rest of the country, there were five more states whose private colleges significantly raised tuition and fees.

The significant tuition decreases at public colleges, which seem counter-intuitive, might occur due to political and governance factors. Across the country, public colleges have less authority over their tuition levels compared to private colleges (Bell, Carnahan, & L'Orange, 2011; Long, 2004). In addition, after the implementation of merit-based aid, there was a state initiative to keep public college tuition low in Florida and Georgia because tuition increases would call for more funding for merit-based aid (Rasmussen, 2003). Considering these state influences, it is not surprising that there is little evidence that supports the Bennett hypothesis at public colleges.

In contrast to public colleges, private colleges have more flexibility over their prices. This might explain why private colleges increased tuition and institutional grants more frequently than public colleges. However, it is still interesting to note that the potential benefit from merit-based aid is much smaller for students enrolled in private colleges. As mentioned previously, there are three states where private college students are not eligible for merit-based aid (Massachusetts, Nevada, and New Mexico). Even in states where private college students were eligible for merit-based aid, the award amounts subsidized a much smaller portion of tuition and fees at private colleges than public colleges due to the high tuition levels at private colleges. Despite the smaller

benefits from merit-based aid, private colleges in some states (e.g., Arkansas, Georgia, and New Mexico) behaved in a way that is more in line with the Bennett hypothesis.

In addition to the public-private difference, price changes widely varied across states. For example, both public and private colleges in Arkansas raised tuition and room and board charges and decreased institutional grants. These price changes allowed colleges in Arkansas to collect more revenue from student charges and save money by reducing their own funds spent on student aid. Florida can be a counter example. Public colleges in Florida significantly decreased tuition and fees, increased institutional grants, and did not change room and board charges, compared to public colleges in other Southern states. Assuming other things are held constant, students in Florida's public colleges were charged less tuition and received more institutional grants than their peers in other Southern states. As a result, attending public four-year colleges in Florida became more affordable for the state's resident students. Lastly, there are many states with mixed results across the three outcomes. For instance, public colleges in Massachusetts increased tuition, institutional grants, and room and board charges. Because the increased institutional grants would offset the tuition increases, it is difficult to tell whether the net price students actually paid increased.

One might think that these heterogeneous effects across states occurred because each state had a different merit-based aid program, as summarized in Tables 1 and 2. For example, generosity of each merit-based aid program might affect the way colleges changed their prices. Presumably, if colleges tried to gather more revenue from merit-based aid, colleges whose state provided a more generous merit-based aid program would raise their prices more than colleges with more selective state merit-based aid program. However, such was not always the case. As an example, Louisiana's merit-based aid subsidized full tuition and fees for public college students with a 2.5

high school GPA and the state's average ACT score; however, there is no observable evidence that public colleges in Louisiana significantly changed any of the three outcomes. In contrast, public colleges in Massachusetts significantly raised tuition and room and board charges although the state's merit-based aid was limited to public college students who were the top 25% on the state's exit exam. These examples show that the generosity of a merit-based aid program is not necessarily related to the way colleges respond to merit-based aid.

Conclusion

My study examines whether or not four-year colleges changed listed tuition and fees, the amount of institutional grants per student, and room and board charges after the implementation of merit-based aid. To summarize, colleges significantly changed these prices after their states implemented merit-based aid. However, these price changes did not always increase the net price that students actually paid for their education. As opposed to the Bennett hypothesis, public colleges in some states significantly reduced tuition and fees in response to their state's merit-based aid. Although private colleges in many states significantly raised tuition and fees, many of them also increased the amount of institutional grants per student, which may offset the negative effects of tuition raises. The direction and magnitude of college responses differed across states, but each program's academic requirements and award amounts were not necessarily related to the way colleges responded to merit-based aid.

These results can be interpreted in two ways. First, merit-based aid does not make our public colleges more expensive in most states. Although colleges in a few states significantly raised tuition and/or room and board charges, some of them also increased institutional grants. Moreover, public colleges in many states either decreased or did not significantly change tuition

and fees. Considering these results, attending public college in most merit-based-aid states becomes more affordable for students eligible for merit-based aid. As listed tuition and fees have remained stable or even decreased in many states, receiving merit-based aid helps students pay their tuition. If students received other sources of financial aid (e.g., Pell Grants) in addition to merit-based aid, merit-based aid could significantly reduce their unmet needs. Even for students who were not eligible for the aid programs, the introduction of merit-based aid did not significantly raise the cost of attending public four-year colleges in most states.

Second, colleges may have used the additional revenue from state merit-based scholarships to subsidize their students rather than to reduce the amount of institutional grants and secure more revenue. Both public and private colleges in many states significantly increased the dollar value of institutional grant that each student received. Although it is not clear to whom these colleges distributed the additional institutional aid, they might spend their money on subsidizing out-of-state students or needy students who did not receive state merit-based scholarships. In either case, the creation of state merit-based scholarships may have allowed these colleges to provide more in their institutional grants and enhance college affordability for their students.

To conclude, the Bennett hypothesis did not always hold in the context of statewide merit-based aid. This is good news for both students and state legislatures. As states start new aid programs, students with solid academic records can benefit from the aid. State legislatures can also see that the money they invested in merit-based aid programs is used, as intended, to improve college affordability.

My study contributes to the field by testing the Bennett hypothesis using all thirteen states that implemented merit-based aid. Although my study adds to the literature, there are some limitations that my study does not address. First, my study does not examine why colleges respond

to merit-based aid in certain ways. Although I provide possible explanations such as political factors, testing these possibilities is out of the scope of my study. Future research that explores these potential factors will improve our understanding of the economic behavior of colleges. Second, although I find increases in institutional grants per student in many states, it is not yet clear to whom they distributed the money. Did colleges spend their money on students who already received merit-based aid to complement their unmet needs, or on students who were not eligible for merit-based aid such as low-achieving students or nonresident students? Exploring this question will provide another important, but mostly missing, piece to the puzzle of how colleges respond to increased government aid. Lastly, future research needs to examine whether or not creating merit-based scholarships makes a difference in college affordability at the student level. Although I find that colleges in many states did not increase their net price relative to colleges in other states, my study does not provide information about how these state and college policies affected how students paid for their tuition. For example, after merit-based aid started, how many students benefitted from these programs? In states with merit-based aid, were students less likely to take out loans? Although my study shows that creating merit-based aid did not significantly raise college costs in many states, it is important to examine whether or not students actually took advantage of new scholarships and the effect this had on their college success.

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